Resource Action: EWG – 56	**Task Force Recommendation Category: 1**

Potential Waterfowl Brood Pond Construction on the Thermalito Afterbay

1.0 Description of Potential Resource Action:

This Potential Resource Action involves construction of four additional brood ponds within the Thermalito Afterbay over the term of the new FERC license. This Resource Action is one of several waterfowl related Resource Actions currently under consideration to minimize the affects of project operations on waterfowl reproduction.

2.0 Nexus to Project:

Water level fluctuations on the Thermalito Afterbay related to hydropower generation can adversely affect brooding waterfowl under certain conditions. Physical topography of the Thermalito Afterbay is such than even relatively minor lowering of the water surface elevation can result in extensive areas of exposed open mudflats along the northern and eastern edges. These mudflats contain little of no cover. Further, as drawdown continues the distance from open water to cover increases. Under these exposed conditions waterfowl broods are subject to high predation rates.

Figure 1. Exposed mud flats at Thermalito Afterbay (water surface elevation (124.0)

3.0 Potential Environmental Benefits:

The Department of Water Resources (DWR), California Department of Fish and Game (DFG), California Waterfowl Association (CWA), and other stakeholders have worked cooperatively over the last 15 years to increase waterfowl production on the Afterbay. One cooperative program to address the reduced cover associated with Afterbay operations involved construction of waterfowl brood ponds. These ponds are constructed by creating a small earthen dam across an inlet of the Afterbay. These impoundments maintain a relatively stable water surface elevation which allows the establishment of emergent vegetation as well as submerged aquatic habitat. Further, these impoundments would create conditions where the open water and terrestrial cover habitats are immediately adjacent. These brood ponds can significantly reduced waterfowl brood mortality.

The waterfowl brood ponds are constructed to reduce brooding waterfowl losses and increase production. The brood ponds also receive disproportionately heavy use as waterfowl pair water prior to the nesting season. The existing brood ponds provide improved habitat conditions for a variety of terrestrial and aquatic species including special status species.

4.0 Potential Constraints

Construction of waterfowl brood ponds has the potential to affect cultural resources and recreational use. Prior brood pond borrow area excavations have encountered significant palentological resources. DFG currently restricts recreational use in the vicinity of waterfowl brood ponds during the nesting and brooding period. However, some existing brood ponds receive heavy recreational use outside the nesting/brooding period including dog trials, swimming, hunting, fishing, and nature study.

Construction of the waterfowl brood ponds requires that Afterbay water levels be drawn down during the construction period. Timing of construction must be coordinated with DWR operations to minimize or avoid power generation or water supply impacts.

5.0 Existing Conditions in the Proposed Resource Action Implementation Area:

This Resource Action will substantially alter conditions in four inlets of the Thermalito Afterbay. Creation of the brood ponds will provide a more stable site for establishment of emergent vegetation, aquatic vegetation, and improved moisture regimes for adjacent upland habitats. These more stable water surface elevations will provide habitat for species dependant on submerged aquatic vegetation and emergent vegetation (Photos 1 and 2). However, species dependant upon exposed flats (primarily shorebirds) would experience reduced habitat suitability in the four Afterbay inlets proposed for treatment during the period of brood pond inundation.

Photo 1. Brood pond submerged aquatic habitat

Photo 2. Brood pond emergent cover

During September 1991, the DWR, DFG, CWA and other stakeholders evaluated approximately 22 potential brood pond locations within the Thermalito Afterbay. Evaluation criteria included:

- Site not near high human use areas
- Dam crest elevation of 133.0 feet
- Minimal earthwork quantities
- Availability of construction materials and access to the site
- Normal Afterbay surface elevation of 130 to 131 feet
- Potential of expected use for nesting waterfowl

Twelve potential brood pond locations including C1, C3, E1, F2, F3, I1, J1, J2, K1, L1, L2, and L3 were eliminated from further evaluation based on the evaluation criteria. Proximity to high public use areas was the most frequently used exclusion criteria. Five waterfowl brood ponds were subsequently created (Figure 1) as a cooperative effort including 1A, A2, 4, B1, and C2. Four additional brood ponds were identified as meeting all the selection criteria including G-1, H-1, D-1, and F-4 or F-1 (Figure 2).

6.0 Design Considerations and Evaluations:

- Site not near high human use areas
- Dam crest elevation of 133.0 feet
- As low as possible earthwork quantities
- Availability of construction materials and access to the site
- Normal Afterbay surface elevation of 130 to 131 feet
- Potential of expected use for nesting waterfowl
- Incorporation of a head-gate release structure
- Avoidance of sensitive habitats

6.1 Environmental Permitting

These brood ponds can require a number of State or federal permits prior to construction including:

- U.S. Army Corp. of Engineers Clean Water Act 404 Permit
- Regional Water Quality Control Board Clean Water Act 401 Water Quality Certification
- DFG 1601 Streambed/Lakebed Alteration Agreement

6.2 Threatened and Endangered Species

A few of the special status species which have been observed on or near these brood ponds include bald eagle, osprey, black tern, American bittern, American white pelican, white-faced ibis, black-crowned night heron, double-crested cormorant, long-billed curlew, and short-eared owl. Further, these ponds also provide potentially suitable habitat for species protected under the State and/or federal Endangered Species Acts including bald eagle, giant garter snake and red-legged frog.

Construction access and borrow area selection will be designed to avoid impacts on vernal pool habitats and rare plant populations.

6.3 Previous Results

Qualitative observations of the existing waterfowl brood ponds indicate that the brood ponds receive disproportionately high waterfowl use throughout the year compared to unmanipulated areas of the Afterbay. Further, preliminary data indicate that waterfowl brood ponds can reduce waterfowl brood losses and increase production (Anthrop pers. comm.).

6.4 Additional Operations and Maintenance

No post-construction operational changes will be required. Brood ponds can be recharged either through Afterbay water levels or pumpage. Design criteria for future brood ponds would allow newly constructed brood ponds to be recharge from the same Afterbay level fluctuations and time periods as the currently existing brood ponds.

Properly designed and engineered brood ponds require relatively little long-term maintenance. DFG has drained a brood pond on at least one occasion to eliminate non-native fish species. Drainage can require a substantial manpower for fish rescue efforts.

6.5 Evaluation and Monitoring

The principal evaluation criteria for evaluation of the success of the potential brood ponds will be water level stability during the waterfowl brooding season. Other than annual inspection related to structural integrity, no additional monitoring is recommended.

6.6 Closely Related Resource Actions

This Resource Action is closely associated with two potential Resource Actions (EWG-68A – Recharge of Waterfowl Brood Ponds and EWG-57A - Waterfowl Nesting Cover Enhancements). All three potential Resource Actions work together to minimize the potential adverse impacts associated with Afterbay water level fluctuations on waterfowl survival and production.

EWG-57A provides nesting habitat for waterfowl displaced by Afterbay water level fluctuations while EWG-68A identifies a schedule for brood pond recharge to maintain the functionality of both existing and any future ponds.

7.0 Synergism and Conflicts:

The goal of this Resource Action is to (in coordination with EWG-68A and 57A) improve waterfowl nesting, production, and survival. Although incremental benefits can be provided through implementation of any of the three potential Resource Actions, they will be most affective if implemented as a package. Additional brood pond construction is most effective if the ponds can be filled and maintained at levels where suitable cover is adjacent to brood water during the waterfowl brooding period. Providing adequate brooding habitat within ¾ miles of high quality nesting habitat minimizes waterfowl losses during critical waterfowl life stages.

8.0 Uncertainties:

Over the last 15 years the brood pond concept has proven to be an effective management tool at the Thermalito Afterbay, providing a relatively stable source of cover for young ducklings in comparison to the Afterbay.

9.0 Cost Estimates:

A 1993 DWR internal memo provides rough cost (+ or – 10 %) estimates for several of the currently constructed brood ponds. These cost ranged between $60,000 and 90,000 per brood pond. These are construction costs which do not appear to include charges related to engineering or environmental permitting. Current construction cost will likely be higher than these 1993 estimates. A rough estimate of current costs (including engineering and permitting) would likely be 30 to 50 percent greater or $78,000 to $134,000 per brood pond.

10.0 Recommendations:

Brood ponds are an effective, documented method to reduce the affects of water level fluctuations at the Thermalito Afterbay on waterfowl survival and production. Further, the brood ponds provide habitat diversity within the Thermalito portion of the OWA resulting in increased wildlife species diversity benefiting a wide range of wildlife species including several special status species.

11.0 Literature Cited

Dr. Don Anthrop personal communication April 2003

DWR Memo from Linton Brown (Northern District) to Forest Neff (Operations and Maintenance (Headquarters) February 19, 1993

DWR Memo from Ed Barnes (Northern District) to Thermalito Afterbay Duck Pond Committee, October 7, 1991

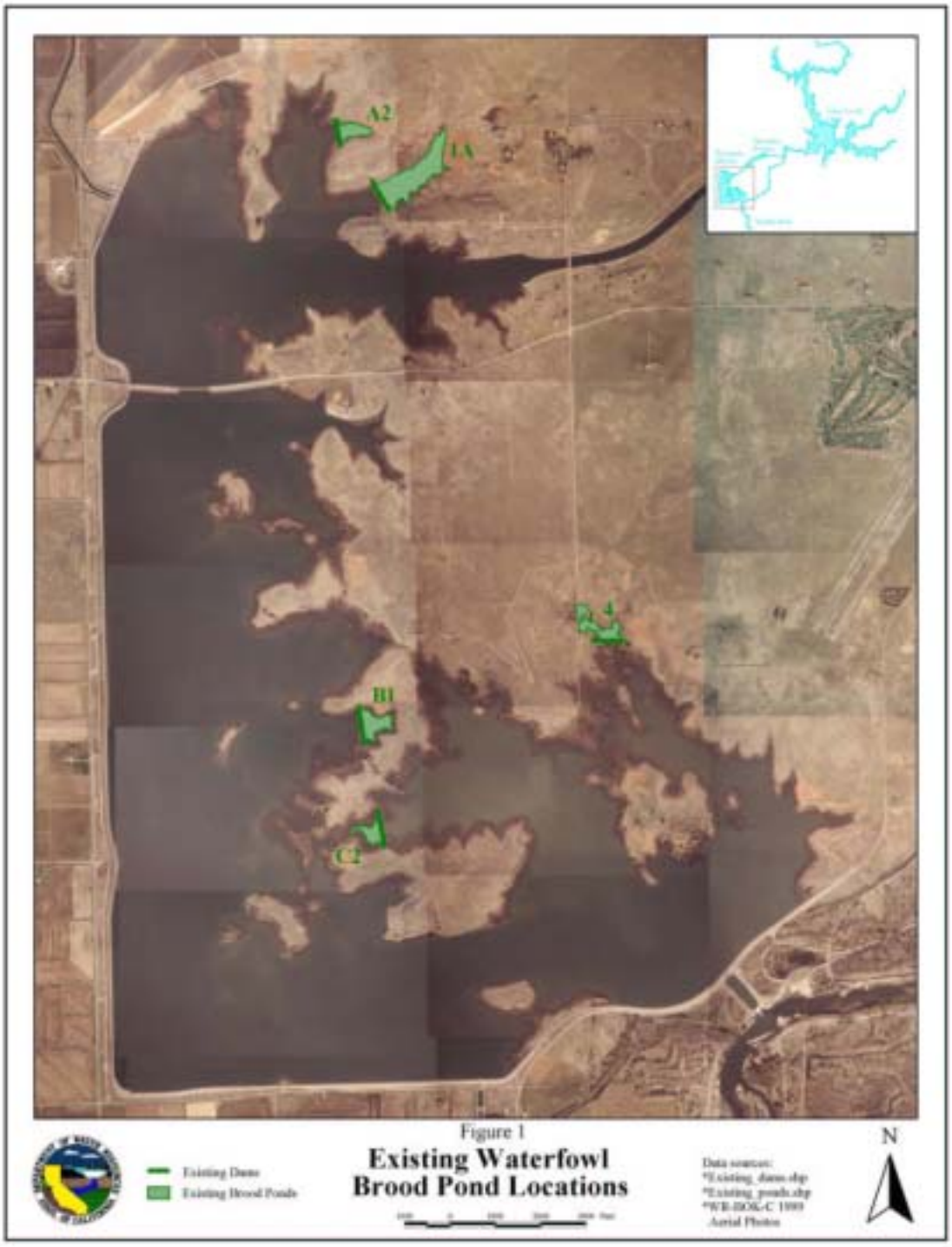

A2
1A
4
B1
C2
Existing Dams
Existing Brood Ponds
Existing Waterfowl
Brood Pond Locations
N

Figure 1


D1
F4
F1
G1
H1
Potentially Suitable Dams
Potentially Suitable Brood Ponds
Potentially Suitable Additional Brood Pond Locations
Data sources:
*potential_dams.shp
*potential_ponds.shp
*WR-HOK-C 1999 Aerial Photos
N

Figure 2

Resource Action: EWG – 57A **Task Force Recommendation Category: 1**

Potential waterfowl nesting cover enhancement and maintenance at the Thermalito Afterbay

1.0 Description of Potential Resource Action:

This Resource Action involves annual maintenance and development of a total of 200 acres of waterfowl nesting cover within the Thermalito Afterbay portion of the Oroville Wildlife Area (OWA) on an annual rotational basis. Approximately 60 acres would be disked, seeded, and fertilized annually while the remaining 180 acres of previously treated nest cover enhancements would be fertilized to maintain stand density annually. Disking and seeding would occur in the fall after the first fall rains, while fertilization would occur in the early spring.

1.1 Background

The Thermalito Afterbay receives significant waterfowl use year-round. Both marginal wetlands and adjacent upland cover are utilized by mallards for nesting cover. Nesting mallards require dense, green, tall, vegetation for nesting within 3/4 miles of brood water. These characteristics are generally lacking within the upland habitats surrounding the Afterbay. However, low nest densities (0.16 nests/acre) do occur within these upland habitats (SP-T1 Interim Report). Lack of adequate cover within upland habitats leads to increased predation rates of mallard nests (Dr. Anthrop pers. comm.). Suitable nesting habitat characteristics are present within the 900 acre wetland margin of the Afterbay. Higher nest densities (0.28 nests/acre) are present within this habitat (SP-T1 Interim Report). However, waterfowl nests within the Afterbay wetland margin are subject to inundation due to project operations.

Figure 1.1.1 Mallard nest in dense vetch cover

The California Department of Water Resources (DWR), California Department of Fish and Game (DFG), California Waterfowl Association (CWA) and other stakeholders have worked cooperatively to enhance waterfowl production at the Afterbay over the last 15 years. Extensive experimentation, habitat improvement, and monitoring have occurred. Data analyses indicate that upland cover enhancement involving disking, seeding, and fertilization;

- Can increase waterfowl nesting densities to about 10 nests/acre
- May reduce nest predation
- Can maintain adequate cover for 3 to 4 years with annual fertilization
- Can in combination with spring water level control, reduce or eliminate nest losses along the wetland margin
- Cost about $140-$160/acre for initial planting and $28-$30/acre for subsequent fertilization (Dr. Anthrop pers. communication)

2.0 Nexus to Project:
Water level fluctuations on the Thermalito Afterbay related to hydropower generation can adversely affect nesting waterfowl under certain conditions. Physical topography of the Thermalito Afterbay is such than even relatively minor increases in the water surface elevation can result in flooding of waterfowl nests along the 900 acre wetland margin.

3.0 Potential Environmental Benefits:
Waterfowl nesting cover enhancement can increase nesting densities from 0.16 nests/acre up to10 nests/acre and reduce nest losses due to project operation if developed in coordination with water level control of the Afterbay during the primary waterfowl nesting season. Further, these waterfowl nesting cover enhancements may serve to reduce predation.

Waterfowl nest cover plots provide cover and/or forage for a variety of wildlife species including reptiles, amphibians, small mammals, and other species of birds. Several special status species forage or nest within these cover enhancements including northern harrier, white-tailed kite, short-eared owl, American bittern, prairie falcon, and Cooper's hawk. The waterfowl nest enhancements provide both plant species and structural diversity to the upland habitats, increasing habitat diversity and ultimately wildlife species diversity.

4.0 Potential Constraints
Several potential constraints serve to limit the amount of waterfowl nest cover which is practicable to produce at the Thermalito Afterbay including;

- presence of vernal pools, swales and other jurisdictional wetlands
- presence of cultural resources
- presence of rare plant populations
- need to avoid areas of high recreation use
- treatment areas need to be dry enough to allow equipment access for fall disking and planting or spring fertilization
- need to locate waterfowl nest cover enhancements as close as possible to waterfowl brood ponds/habitat
- areas needed for other DFG wildlife habitat improvements (wintering waterfowl forage plots)

5.0 Existing Conditions in the Proposed Resource Action Implementation Area: The areas most suitable for waterfowl nesting cover enhancement are those upland areas around the Afterbay where food or nest cover plantings have occurred historically as they generally meet all of the design considerations listed below.

Conditions in these areas where food and cover plantings have historically occurred are slightly different than adjacent undisturbed areas. These areas tend to be in more upland situations where seasonal equipment access is possible. Historic disking has resulted in a general leveling of the physical micro topography and improved drainage. Past disturbance (disking, planting, fertilization) related to food and cover enhancement has lead to reduced native plant species diversity in these areas. No special status plant species have been identified in the upland habitat around the Thermalito Afterbay. However, a CNPS list 2 plant is common within the wetland margin. Relicensing stakeholders have identified the need to maintain native plant species diversity within the upland plant community around the Afterbay.

The height, density, and moisture content of waterfowl nesting cover are strongly correlated with spring precipitation and fertilization. Low precipitation during February, March, and April are unlikely produce the same level of nesting density as above normal precipitation in these months.

6.0 Design Considerations and Evaluations:

- Avoidance of sensitive resources including wetlands, vernal pools, and swales
- Avoidance of high recreation use areas
- Dry enough for fall/winter equipment use during disking and planting
- Soil suitability
- Site accessibility
- Proximity to adequate brooding habitat
- Greater nest densities documented on hill or slope as compared with level ground
- Minimize impact to previously undisturbed upland habitats which harbor higher densities of upland native plant species
- Minimize impacts to current or future land use, operations, or maintenance

6.1 Environmental Permitting

- Wildlife management activities on designated wildlife management areas are categorically exempt under CEQA.
- No Clean Water Act 404/401 permit is required if impacts to vernal pools, vernal swales, water quality, and other wetlands are avoided.
- Agricultural activities are not regulated under the Regional Water Quality Control Board's stormwater permit process.

6.2 Threatened and Endangered Species

Several State or federal species of concern may utilize the cover enhancements for nesting including northern harrier, short-eared owl, and American bittern. Further, these cover enhancements can provide foraging habitat for a variety of State and federal

species of concern including northern harrier, short-eared owl, American bittern, prairie falcon, white-tailed kite, black-crowned night heron, Cooper's hawk, long-eared owl, merlin, and sharp-shinned hawk.

6.3 Previous Results

Data collection over the last 15 years indicate that nest cover enhancements generally result in waterfowl nest densities of 3 to 10 nest/acre (Dr. Anthrop pers. comm.)

6.4 Additional Operations and Maintenance

Assuming that DWR would provide funding to DFG to implement this Resource Action, no additional DWR Operations and Maintenance will be required beyond funding.

6.5 Evaluation and Monitoring

Previous monitoring indicates that not all waterfowl nest cover plots are equally productive. Some monitoring for adaptive management should be considered.

6.6 Closely Related Resource Actions

This Resource Action is closely associated with two potential Resource Actions (EWG-56 – Construction of Additional Waterfowl Brood Ponds and EWG-68A – Recharge of Waterfowl Brood Ponds). All three potential Resource Actions work together to minimize the potential adverse impacts associated with Afterbay water level fluctuations on waterfowl survival and production.

EWG-57A provides a mechanism to insure maintenance of existing brooding habitat while EWG-68A identifies opportunities for additional waterfowl brood ponds.

7.0 Synergism and Conflicts:

The goal of this Resource Action is to (in coordination with EWG-56 and 68A) improve waterfowl nesting, production, and survival. Although incremental benefits can be provided through implementation of any of the three potential Resource Actions, they will be most affective if implemented as a package. Waterfowl nest cover enhancements will be most effective if implemented with close proximity to adequate brooding habitat. Together these three Resource Actions will minimize waterfowl losses during critical waterfowl life stages.

8.0 Uncertainties:

Over the last 15 years waterfowl nest cover enhancement has proven an effective method to significantly increase waterfowl nest production and may also increase nestling survival.

9.0 Cost Estimates:

Based on current costs 60 acres of nest cover enhancement (disking, seeding, and fertilization) would cost approximately $9,600 per year, while annual fertilization costs on the remaining 180 acres would cost approximately $5,400 per year.

10.0 Recommendations:

Waterfowl nest cover enhancement are an effective, documented method to mitigate nesting habitat losses associated with regular spring inundation of the wetland margin of the Thermalito Afterbay resulting in increased waterfowl survival and production. Further, the nesting cover enhancements provide plant species and structural habitat diversity within the Thermalito portion of the OWA resulting in increased wildlife species diversity benefiting a wide range of wildlife species including several special status species.

11.0 Literature Cited

Dr. Don Anthrop personnel communication April 2003

Resource Action: EWG – 68A **Task Force Recommendation Category: 1**

Potential Recharge of Waterfowl Brood Ponds on the Thermalito Afterbay

1.0 Description of Potential Resource Action:

This Potential Resource Action involves evaluation of potentially suitable methodologies to insure that waterfowl brood ponds retain sufficient water throughout the primary waterfowl brooding season to remain functional. This Resource Action is one of several waterfowl related Resource Actions currently under consideration to minimize the affects of project operations on waterfowl reproduction.

1.1 Background

The Department of Water Resources (DWR), California Department of Fish and Game (DFG), California Waterfowl Association (CWA), and other stakeholders have worked cooperatively over the last 15 years to increase waterfowl production on the Afterbay. One cooperative program to address the reduced cover associated with Afterbay operations involved construction of waterfowl brood ponds. These ponds are constructed by creating a small earthen dam across an inlet of the Afterbay. These impoundments maintain a relatively stable water surface elevation which allows the establishment of emergent vegetation as well as submerged aquatic habitat. Further, these impoundments would create conditions where the open water and terrestrial cover habitats are immediately adjacent. These brood ponds can significantly reduced waterfowl brood mortality. However, water losses to evapotranspiration, groundwater recharge, and evaporation serve over time to reduce the water level in these impoundments. Estimated water losses within the brood ponds are 2 to 3 inches of water surface elevation per week during March and April and 4 inches per week from May through September.

Four of the existing waterfowl brood ponds were designed to be recharged at Afterbay water surface elevations of 134.1 feet or higher. One brood pond was engineered at an elevation which precludes recharge via the Afterbay. However, DFG can pump water into this pond if the Afterbay water surface elevation reaches 134.1 feet. Under an informal agreement with the stakeholders, DWR has traditionally attempted to recharge these brood ponds through Afterbay water level fluctuations at regular intervals throughout the primary brooding season (April 15 through July 31). Field observations during the course of relicensing indicate that recharge of brood ponds at three week intervals during the waterfowl brooding season will provide adequate water to maintain the functionality of the ponds.

Stakeholders have suggested that alternative means of brood pond recharge may be substituted for Afterbay water level fluctuations. These alternatives may include pumping from the Afterbay into the brood pond or development of a system of ground water wells which could be pumped to recharge the brood ponds.

The waterfowl brood ponds are constructed to reduce brooding waterfowl losses and increase production. The brood ponds also receive disproportionately heavy use during waterfowl courtship water prior to the nesting season. The existing brood ponds provide improved habitat conditions for a variety of terrestrial and aquatic species including special status species.

2.0 Nexus to Project:

Water level fluctuations on the Thermalito Afterbay related to hydropower generation can adversely affect brooding waterfowl under certain conditions. Physical topography of the Thermalito Afterbay is such than even relatively minor lowering of the water surface elevation can result in extensive areas of exposed open mudflats along the northern and eastern edges. These mudflats contain little of no cover. Further, as drawdown continues the distance from open water to cover increases. Under these exposed conditions waterfowl broods are subject to high predation rates.

Figure 1. Exposed mud flats at Thermalito Afterbay (water surface elevation (124.0)

3.0 Potential Environmental Benefits:

The waterfowl brood ponds were constructed to reduce brooding waterfowl losses and increase production. The brood ponds also receive disproportionately heavy use as waterfowl pair water prior to the nesting season. The existing brood ponds provide

improved habitat conditions for a variety of terrestrial and aquatic species including special status species. A few of the special status species which have been observed on or near these brood ponds include bald eagle, osprey, black tern, American bittern, American white pelican, white-faced ibis, black-crowned night heron, double-crested cormorant, and short-eared owl. Further, these ponds also provide potentially suitable habitat for giant garter snake and red-legged frog (Figure 2)

4.0 Potential Constraints

DWR has historically (under informal agreement) operated the Thermalito Afterbay in a manner which allowed recharge of waterfowl brood ponds during the waterfowl brooding period through operational planning. However, power generation requirements in the future could constrain operational flexibility and require alternative methods of recharge.

5.0 Existing Conditions in the Proposed Resource Action Implementation Area:

This Resource Action will not significantly alter existing conditions. Rather, this Resources Action will formalize at stakeholders request, existing informal agreements and provide guidance to DWR Operations staff on the water surface elevation required to recharge, primary waterfowl brooding season, and frequency and timing of recharge.

Figure 2. High quality giant garter snake and red-legged frog habitat

6.0 Design Considerations and Evaluations:

- Between May 1 and July 15, re-operate Thermalito Afterbay (or other methods) to insure that brood pond is recharged at three week intervals. Recharge via Afterbay fluctuation would require that the surface elevation reaches 134.1 or

greater for a 12-hour continuous period at least every three weeks. Twelve hours are required to recharge the largest brood pond via Afterbay water level fluctuations due to its narrow intake.
- Coordinate recharge events with DFG Oroville Wildlife Area (OWA) staff. This will allow DFG to provide pump recharge into brood pond #4.
- DWR Operations will evaluate this potential Resource Action and identify impacts including costs in water or power, operation flexibility, or other criteria.
- Periodic monitoring will be required to fine tune operational criteria for recharge events.

6.1 Environmental Permitting
- Recharge of waterfowl brood ponds does not require environmental permitting or documentation.

6.2 Threatened and Endangered Species
- Maintenance of spring water surface elevations at the brood ponds would provide habitat benefits to both giant garter snake and California red-legged frog.

6.3 Previous Results
Qualitative observations of the existing waterfowl brood ponds indicate that the brood ponds receive disproportionately high waterfowl use throughout the year compared to unmanipulated areas of the Afterbay. Further, preliminary data indicate that waterfowl brood ponds can reduce waterfowl brood losses and increase production (Anthrop pers. comm.). However, the quality of brooding habitat is reduced as the distance from shoreline cover and open water increases.

6.4 Additional Operations and Maintenance

Brood pond recharge via Afterbay water level fluctuations requires planning and scheduling by DWR Operations. Brood pond recharge via pumpage using a portable diesel pump could require extensive manpower to rotate pumpage among the current 5 brood ponds and four additional proposed brood ponds. Further, fuel and maintenance of the pump would be required.

6.5 Evaluation and Monitoring
The principal evaluation criteria for evaluation of the success of the potential brood ponds will be water level stability during the waterfowl brooding season. No additional monitoring is recommended.

6.6 Closely Related Resource Actions
This Resource Action is closely associated with two potential Resource Actions (EWG-56 – Construction of Additional Waterfowl Brood Ponds and EWG-57A - Waterfowl Nesting Cover Enhancements). All three potential Resource Actions work together to minimize the potential adverse impacts associated with Afterbay water level fluctuations on waterfowl survival and production.

EWG-57A provides nesting habitat for waterfowl displaced by Afterbay water level fluctuations while EWG-68A identifies opportunities for additional waterfowl brood ponds.

7.0 Synergism and Conflicts:

The goal of this Resource Action is to (in coordination with EWG-56 and 57A) improve waterfowl nesting, production, and survival. Although incremental benefits can be provided through implementation of any of the three potential Resource Actions, they will be most affective if implemented as a package. Additional brood pond construction is most effective if the ponds can be filled and maintained at levels where suitable cover is adjacent to brood water during the waterfowl brooding period. Providing adequate brooding habitat within ¾ miles of high quality nesting habitat minimizes waterfowl losses during critical waterfowl life stages.

8.0 Uncertainties:

Over the last 15 years the brood pond concept has proven to be an effective management tool at the Thermalito Afterbay, providing a relatively stable source of cover for young ducklings in comparison to the Afterbay.

9.0 Cost Estimates:

Some loss of operational flexibility may occur. However, historically planning and scheduling of recharge events has not substantially reduced operational flexibility (Curtis Creel Pers. Comm.)

Cost associated with pumpage include

- Initial purchase of suitable portable pump and pipes $15,000-$20,000
- Manpower costs associated with rotating a portable pump between brood pond locations ($18,000/year)
- Annual pump maintenance and fuel ($500 -$1,000/year)

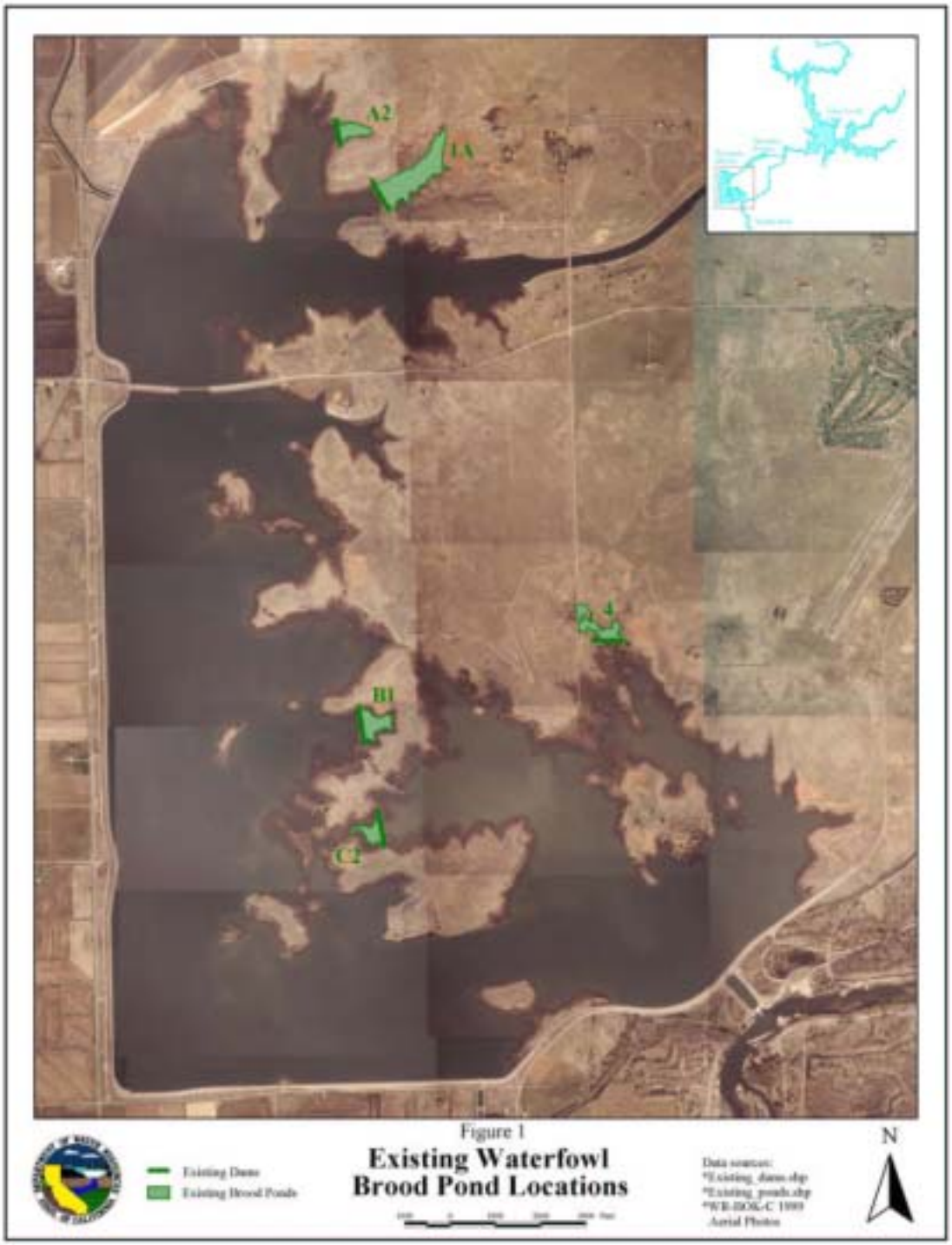
10.0 Recommendations:

Brood ponds are an effective, documented method to reduce the affects of water level fluctuations at the Thermalito Afterbay on waterfowl survival and production. Further, the brood ponds provide habitat diversity within the Thermalito portion of the OWA resulting in increased wildlife species diversity benefiting a wide range of wildlife species including several special status species.

11.0 Literature Cited

Dr. Don Anthrop personal communication April 2003

Curtis Creel, Department of Water Resources, personal communications


A2
A1
B1
C1
Figure 1
Existing Waterfowl
Brood Pond Locations
Existing Dams
Existing Brood Ponds
N


D1
F4
F1
G1
H1
Potentially Suitable Dams
Potentially Suitable Brood Ponds
Potentially Suitable Additional Brood Pond Locations
Data sources:
*potential_dams.shp
*potential_ponds.shp
*WR-HOK-C 1999 Aerial Photos
N

Figure 2

Resource Action: EWG – 103 **Task Force Recommendation Category: 1**

TRANSFER OF BASS FROM THE AFTERBAY BROOD PONDS TO THE AFTERBAY

Date of Field Evaluation: None was conducted for this write-up.

Evaluation Team: Eric See with assistance from Mike Manwaring and Troy Baker

Description of Potential Resource Action:
This Resource Action would be designed to stock the Thermalito Afterbay with black bass that are removed from the brood ponds to protect waterfowl young from predation. This measure has been proposed as an alternative to draining the ponds during the waterfowl brooding season to remove the predatory black bass. The fish could be removed from the ponds by seining, electrofishing, or other appropriate methods annually (or as needed) and placed in the Thermalito Afterbay to prevent the warm water species (i.e. bass) from adversely impacting brooding waterfowl (i.e. ducks) and amphibious species. This Resource Action would allow for an increase in the warm water fishery, while also reducing predation on waterfowl and amphibious species.

The following resource actions are either similar to or directly related to the proposed measure:

- EWG-56, that could be designed to construct and maintain additional brood ponds in the Thermalito Afterbay to accommodate nesting waterfowl.
- EWG-68A, which is designed to recharge the brood ponds at 3-week intervals during the brooding periods,
- EWG-26, that is aimed at improving warm water fish habitat in the Thermalito Afterbay.
- EWG-28, manage water levels in the Thermalito Afterbay aimed at protecting nesting and rearing warm water species (i.e. bass).

Nexus to Project:
- Water level fluctuations in the Thermalito Afterbay hinder the establishment of rooted aquatic vegetation, which reduces cover for game fish and may lead to reduced year-class strength.
- Water level fluctuations in the Thermalito Afterbay may adversely impact warm water game fish nesting and juvenile rearing.

Potential Environmental Benefits:
- The primary intended benefit is increasing the production of warm water game fish in the Thermalito Afterbay.
- There are also additional benefits which could be realized though positive public relations and enhanced recreational opportunities.

Potential Constraints:
Potential constraints associated with this Resource Action could include:

- Effectiveness of the equipment used in capture and relocation of the fish considering the typical shallow nature of these waters.
- Depending on the timing of this Resource Action, there may be disturbance impacts on nesting and rearing waterfowl and other wildlife.
- Design considerations would also need to address the potential for impacts on ESA species.

Existing Conditions in the Proposed Resource Action Implementation Area:
The Department of Water Resources, California Department of Fish and Game (DFG), California Waterfowl Association, and other stakeholders have worked cooperatively over the last 15 years to increase waterfowl production on the Afterbay. One cooperative program to address the reduced cover associated with Afterbay operations involved construction of six waterfowl brood ponds. These ponds were constructed by creating a small levee or dam across an inlet of the Afterbay. These impoundments maintain a relatively stable water surface elevation which allows the establishment of emergent vegetation as well as submerged aquatic habitat. Further, these impoundments create conditions where the open water and terrestrial cover habitats are immediately adjacent. While these ponds have served to increase the warm water fishery in the Afterbay, they are believed to have had negative impacts on waterfowl production because of predation on ducklings.

These ponds also provide ideal spawning and rearing conditions for several warm water game fish species, particularly largemouth bass. These fish have the potential to adversely impact waterfowl through predation. Historic actions to mitigate for this have included draining the ponds, which has resulted in significant mortality of these desirable game fish, and resulted in negative public relations within the community. If this practice were to continued, there could also negative impacts to sensitive species (ESA species of concern). This Resource Action would provide an alternative to draining the ponds as the means to reduce bass predation on waterfowl, and would also enhance the Afterbay sport fishery.

Design Considerations and Evaluation:
This Resource Action would not require any engineering design to achieve its goal of increasing the warm water fishery and reducing the predation on waterfowl. The methodology for the measure could include:

- Boat electrofishing
- Back-pack electrofishing
- Seines
- Fish traps
- All of these could be used in combination with one another

It is uncertain if permitting would be required, because there could be concerns with potential impacts to sensitive species (ESA species of concern) [DFG]. In addition, a scientific collection permit would be required.

This Resource Action could be conducted in conjunction with DWR waterfowl nest counts, to reduce overall disturbance of waterfowl nesting. The measure could be conducted on an as needed basis, but would likely be needed annually or biannually.

The results of the Resource Action could be measured by using fish inventories and population trends (including fish numbers, species, and sizes of fish, and how they vary over time).

Synergism and Conflicts:
Synergisms could be created if this measure is planned in conjunction with other Resource Actions designed to enhance the Afterbay fishery. This includes EWG-26, EWG-28, EWG-56, EWG-68A, plus additional Resource Actions being proposed by the Recreational Work Group.

Potential conflicts would include a proposed design component of EWG-56, which deals with draining the brood ponds to remove predatory fish (i.e., bass). However, if designed correctly, this Resource Action could be an opportunity to reduce impacts on nesting waterfowl in the brood ponds while enhancing the Afterbay fishery.

Uncertainties:
Although this Resource Action would not require any complex engineering design, there would be a few uncertainties associated with implementing this measure. These would include:

- Effectiveness of the equipment used in capture and relocation of the fish considering the typical shallow nature of these waters.
- Lack on knowledge on the predation rate, and number of fish that utilize the ponds.
- Determining the appropriate schedule for this measure to be most effective (annual, biannual, or even semiannual).
- Design considerations would also need to address the potential for impacts on ESA species.

Cost Estimate:
An initial cost estimate for this Resource Action includes costs for equipment and man-power. The anticipated costs would likely be on the order of less than $1,500 per pond, per year, assuming no large-scale equipment purchases would be needed (i.e., electrofishing boats).

Recommendations:
This measure should be considered as a potentially viable solution for protecting waterfowl from bass predation in the brood ponds, which has been identified as a negative impact by DFG. In addition, this would enhance the Afterbay sport fishery at a

relatively low cost, and may also provide positive public relations for DWR within the community.